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What Do Deer Eat?

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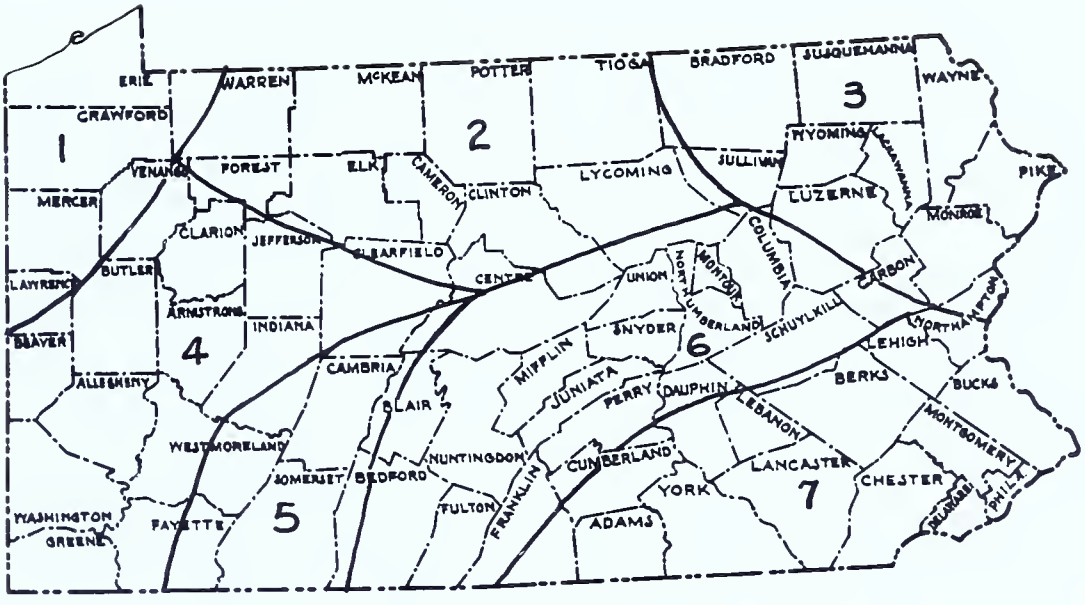

FIG. 1—REGIONS based on physiographic and vegetative criteria.

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ALMOST EVERYONE wants to know what deer eat. Students, teachers, farmers, hunters, nature lovers, biologists, land managers and planners—all are interested in the food habits of Pennsylvania's state animal, the whitetailed deer.

A short simple answer might be that deer are primarily vegetarians, although they have been known to eat meat. But such a short answer seldom satisfies those who inquire; they want something more specific and those who are responsible for deer habitat improvement certainly need more detailed information. In addition to knowing exactly what deer eat, habitat managers need to know how much they eat, and when and where they eat it. These men also need to know how important various foods are in the diet of deer throughout the year.

This information can be, and has been, acquired by a number of methods. Recently (1970 and 1971) the Pennsylvania Game Commission, in cooperation with the Pennsylvania State University Wildlife Research Unit, used stomach content analysis technique to determine the seasonal and regional uses of food by whitetailed deer.

The state was divided into seven regions based on physiographic and vegetative criteria (Fig 1). A few game protectors in each region were

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assigned the task of collecting a dozen samples each season from road-killed deer. The rumen content samples were preserved in one-quart jars containing two cups of 10 percent formalin, and the date and location of each sample was recorded. In all, 1028 samples were collected and forwarded to the Wildlife Research Unit laboratory where they were analyzed by wildlife biologists from the Game Commission and the Research Unit.

The samples were washed through a series of three sieves to separate the fine from the coarse particles of food. Only the coarse particles were retained for examination as earlier studies had shown that the proportions of various food items in the fine particles

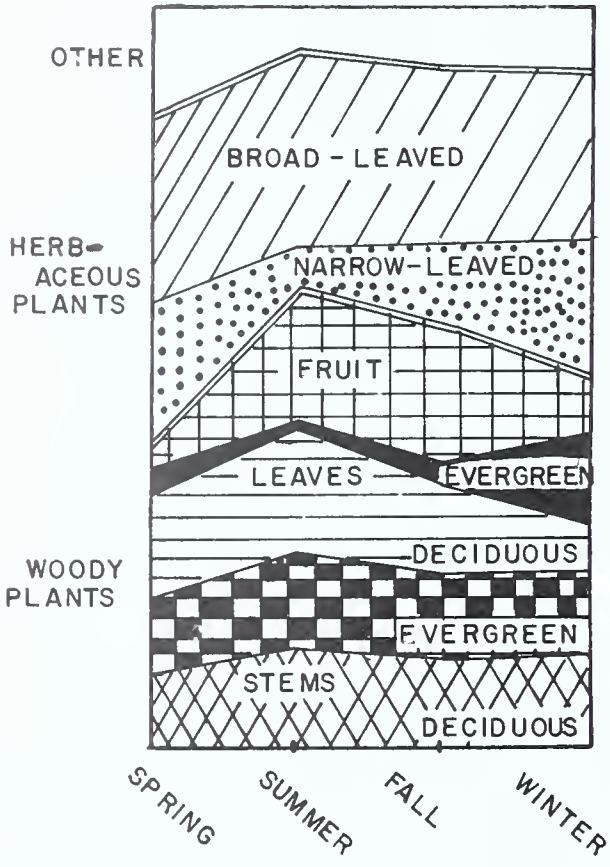

FIG. 2—Seasonal foods of deer, based on importance values. Study the area taken up by each category, not the height of the line above bottom.

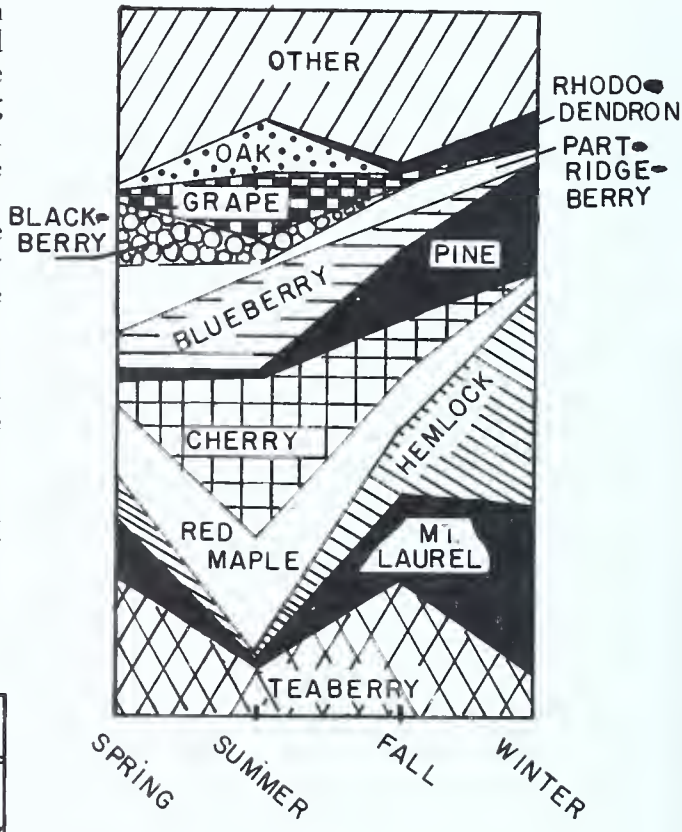

FIG. 3—Seasonal use of leaves from woody plants by deer, based on importance value. Use is associated with seasonal availability.

were about equal to those in the larger pieces, and that it takes about ten times as long to separate and identify the small particles as it does the large ones.

Material that did not pass through the sieves was emptied onto large aluminum sheets and separated by species, when recognized, according to plant parts as fruit, green leaves, dead leaves, succulent twigs, and hardened twigs. Materials that could not be identified by species were separated into grossly different categories. The volume of each item was measured by water displacement.

Some foods showed up frequently but in small volume, others were found in large volume but low frequency; and still others were found in combinations of these two characteristics.

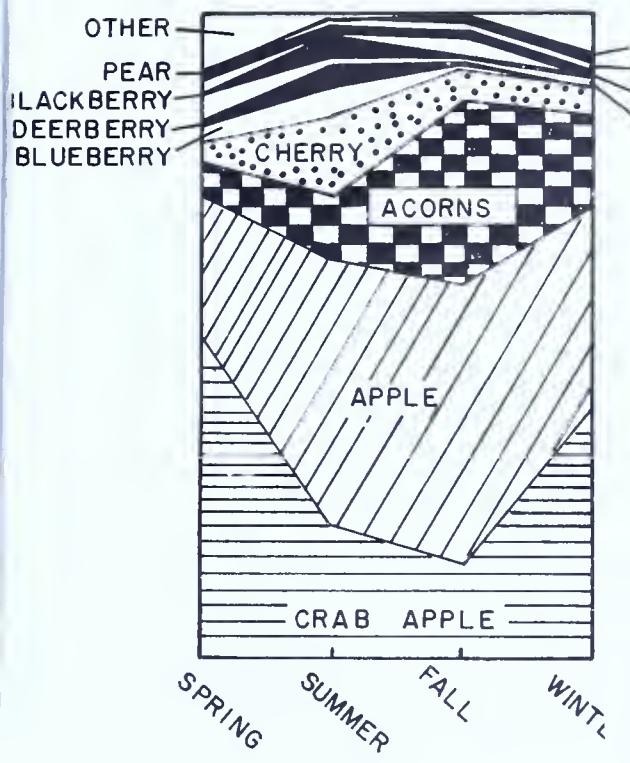

FIG. 4—Seasonal use of fruit from woody plants by deer, based on importance value.

To better evaluate and illustrate the frequency of occurrence and the volume, these two measured characteristics were combined into one by adding the percent of frequency to the percent of volume and dividing by two. This characteristic is called the importance value. Using it, the significance of both the volume and presence of each item is maximized and believed to be more realistic than using volume or frequency above.

The findings of this study have been summarized in the graphs that accompany this article. When examining Figs. 2 through 5, readers are cautioned to study the *area* taken up by each category, not the height of any particular line above the bottom.

In Fig. 2, the seasonal foods of deer based on importance value, note the overall greater importance of woody plants as compared to herbaceous or non-woody material, and also the seasonal differences or similarities in the use of the various parts of woody plants. When fruits are readily available during the fall and summer, for example, they make up a larger portion of the diet. On the other hand, leaves are eaten uniformly throughout the year and the use of evergreen leaves in the winter compensates for the absence of leaves from deciduous plants. The stems from woody plants make up about 20 percent of the diet and this remains rather constant throughout the year. The importance of evergreen stems and leaves is even more significant, considering that only about 10 percent of our forests are evergreens. The high and rather constant use of

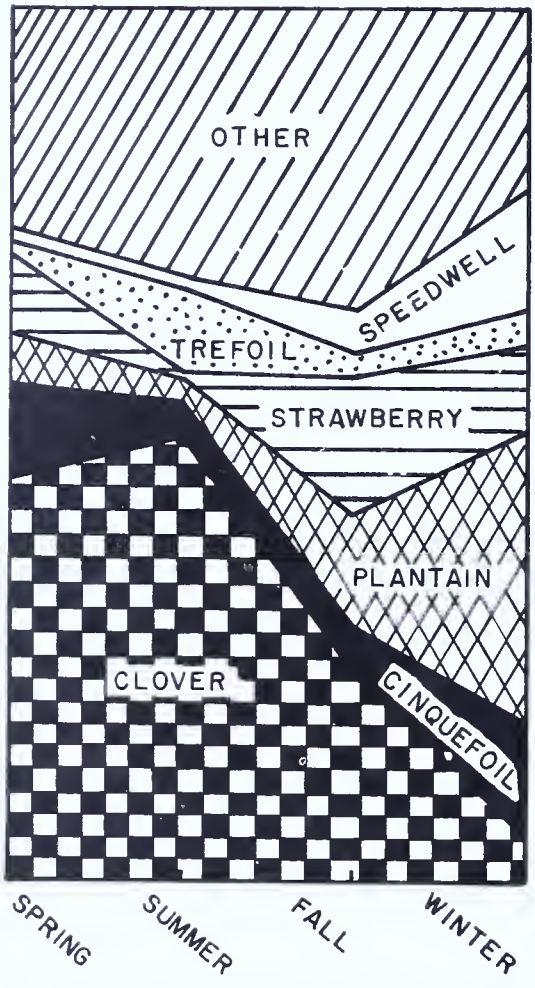

FIG. 5—Seasonal use of broad-leaved herbaceous plants, based on importance value.

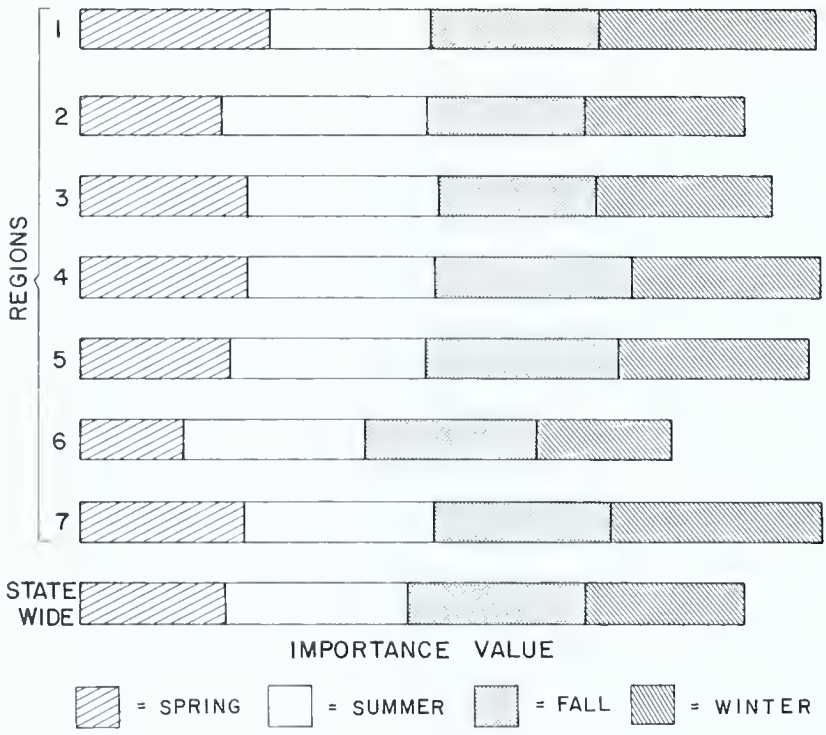

FIG. 6—Seasonal and regional use of deciduous stems by deer, based on importance value. Use of stems was quite similar in all seasons and all regions.

herbaceous plants, an average of about 30 percent, shows the importance of this plant group.

A closer look at the use of leaves from woody plants (Fig. 3) reveals red maple, cherry, blueberry, grape, and oak were the most prevalent in summer, while hemlock, laurel and pine were more prevalent in the winter. Note how closely use is associated with availablity.

Apples and acorns were important as indicated in fruits, Fig. 4. It should be mentioned that there was an exceptionally large crop of apples produced during the time of the survey. Nevertheless, even during normal or average years, the use of apples by deer is rather high. Acorns too play a very important role in the diet of deer even though, like apples, their production is erratic and variable from place to place. It may surprise you to note the presence of fruits of cherry,

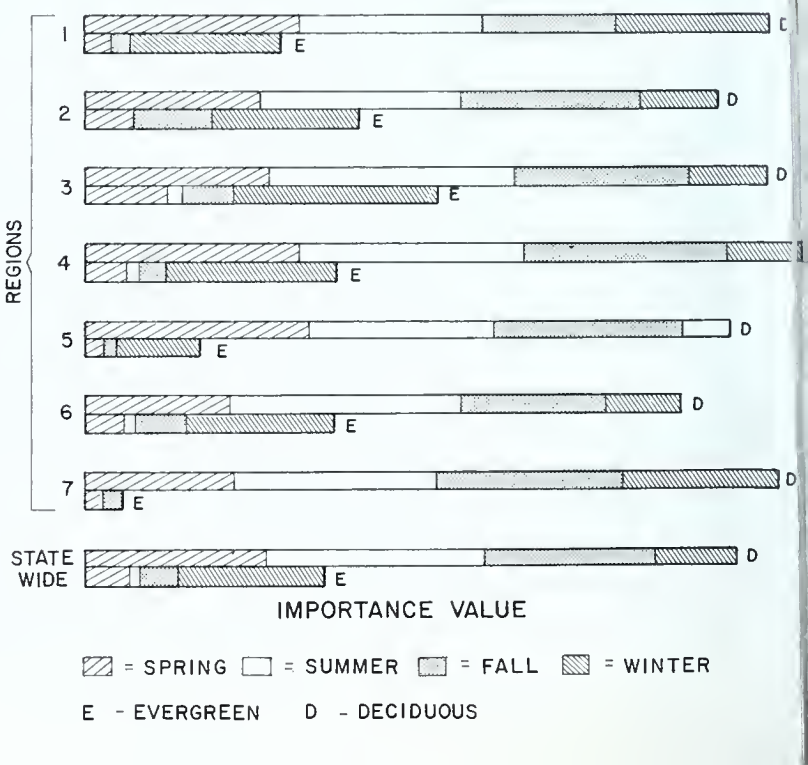

FIG. 7—Seasonal and regional use of leaves by deer, based on importance value. Importance of leaves was quite different in different regions and seasons. Note importance of evergreens during the winter.

blueberry, grape, blackberry and other plants present in the stomach of deer.

Illustrated in Fig. 5 are the most commonly occurring broad-leaved herbaceous plants in order of relative importance. Clover was apparently a highly sought after food in spring and summer. Other species such as plantain, speedwell, trefoil, strawberry and cinquefoil were commonly utilized to various degrees during the four seasons. Many other herbaceous plants were also used. Table I gives the complete listing of all plants positively identified in the samples.

To show some regional differences and/or similarities of foods used by deer it was necessary to single out distinct species or groups of plants. Fig. 6 shows that the use of stems from woody plants was quite similar in all regions and in all seasons. On the other hand, the importance of leaves, both evergreen and deciduous, was quite different between regions and seasons (Fig. 7). Note again the importance of evergreens during the winter.

Acorns were more important in some regions than in others, as indicated in Fig. 8. These differences are obviously caused by the presence or absence of oak trees and/or acorn mast. Acorn production varies from year to year, and place to place within and between species.

As would be expected, large differences also existed between the seven regions in the occurrence of corn in the rumens sampled. Fig. 9 shows corn occurred more frequently in rumens from the farming regions than in the forested regions. Even at that, the winter use of corn, especially in the low corn producing areas, is surprising. Perhaps these values were exaggerated by proximity of waste corn in fields near woodlands and the use of corn in "winter feeding programs."

In general terms, seasonal differences in foods were found to be greater than regional differences. About 60 percent of the diet year-

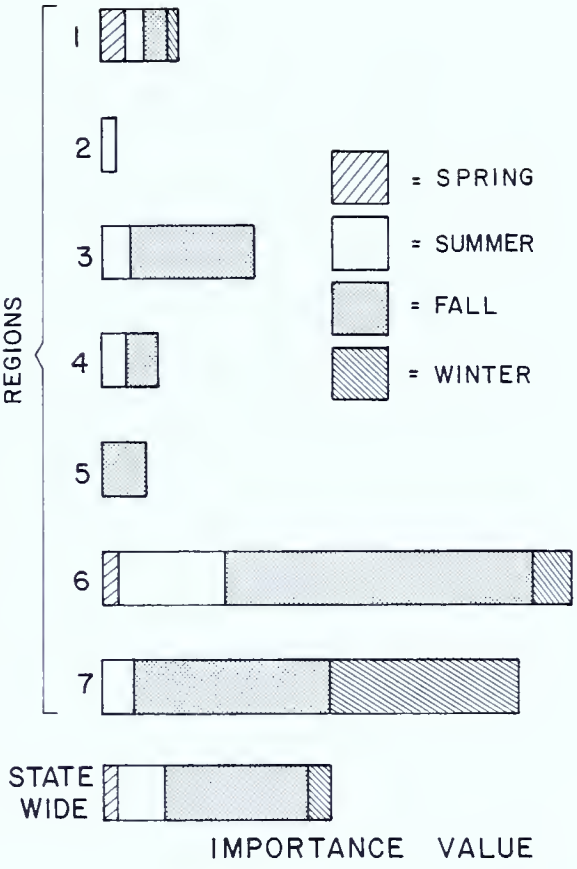

FIG. 8—Seasonal and regional use of acorns by deer. Regional differences are caused by the presence or absence of oaks.

round consisted of woody plants. The importance of woody stems, leaves and fruit changed with the seasons in all regions. Fruit utilization was the most variable, because of seasonal availability. Leaves were an important year-round food, with evergreen utilization increasing when deciduous leaves were less available. Woody stems also were an important year-round food, with hardened stem utilization increasing when succulent stems were less available.

It is obvious, however, that deer make choices from what is available. Succulent plants or parts of plants were chosen over hardened vegetation. Hardened twigs and evergreens were used more when other sources of food were less available, and individual species of plants or parts of plants were utilized to various degrees and at

various times throughout the year.

In summary, it can be said that deer utilize many kinds of food, their choices being strongly governed by the succulence and palatability of whatever is available at a given time. It follows that habitat management for deer should be geared to making food available when and where deer need it most, in the most economical fashion.

TABLE I

Plants, or Parts Thereof, Identified in the Stomach Content Samples.

Woody Plants

Apple
Arbor Vitae
Ash
Aspen
Beech
Birch
Blackberry
Black Cherry
Black Locust
Blue Beech
Blueberry
Cherry
Chestnut Oak
Coralberry
Crab Apple
Deerberry
Dewberry
Dogwood
Elderberry
Elm
Grape
Gray Dogwood
Greenbriar
Hawthorn
Hazelnut
Hemlock
Hickory
Honeysuckle
Jack Pine
Juneberry
Larch
Mountain Laurel
Mulberry
Oak
Orange
Partridge-Berry
Pear
Persimmon
Pine
Pitch Pine
Privet
Red Oak
Red Cedar
Red Maple
Rhododendron
Rose
Sassafras
Spruce
Sugar Maple
Sumac
Sweet Fern
Teaberry
Tulip Poplar
Virginia Creeper
White Pine
Willow
Witch Hazel

Non-Woody Plants

Alfalfa
Aster
Bean
Bellwort
Cabbage
Canada Mayflower
Cantaloupe
Carrot
Cinquefoil
Clover
Club Moss
Cohash
Corn
Crown Vetch
Dandelion
Domestic Lettuce
Goldenrod
Ground Cherry
Indian Pipe
Liverwort
Mayapple
Milkweed
Oats
Panic Grass
Plantain
Pokeweed
Potato
Ragwort
Rye
Sheep Sorrel
Soybean
Speedwell
Spikenard
Spring-Beauty
Strawberry
Tomato
Trefoil
Violet
Wheat
Wild Ceranium
Wild Mustard

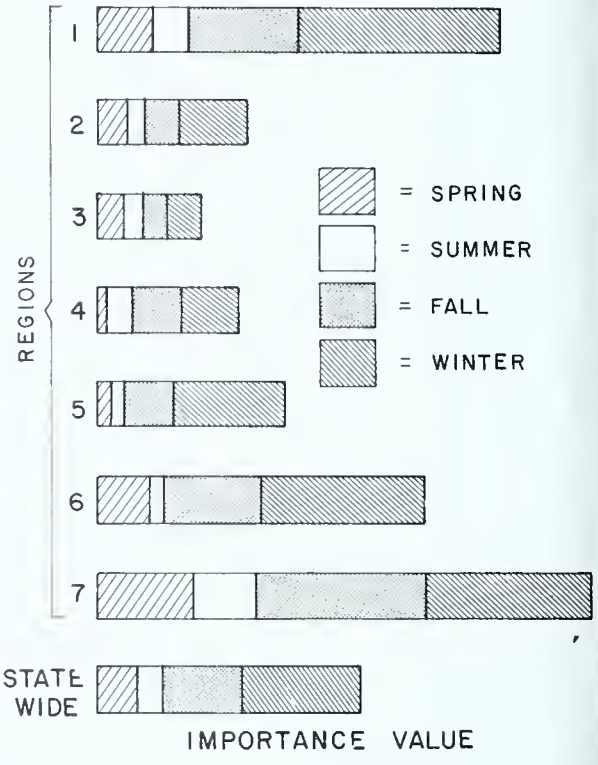

FIG. 9—Seasonal and regional use of corn by deer. This food's importance in low corn producing areas might have been exaggerated by winter feeding programs.